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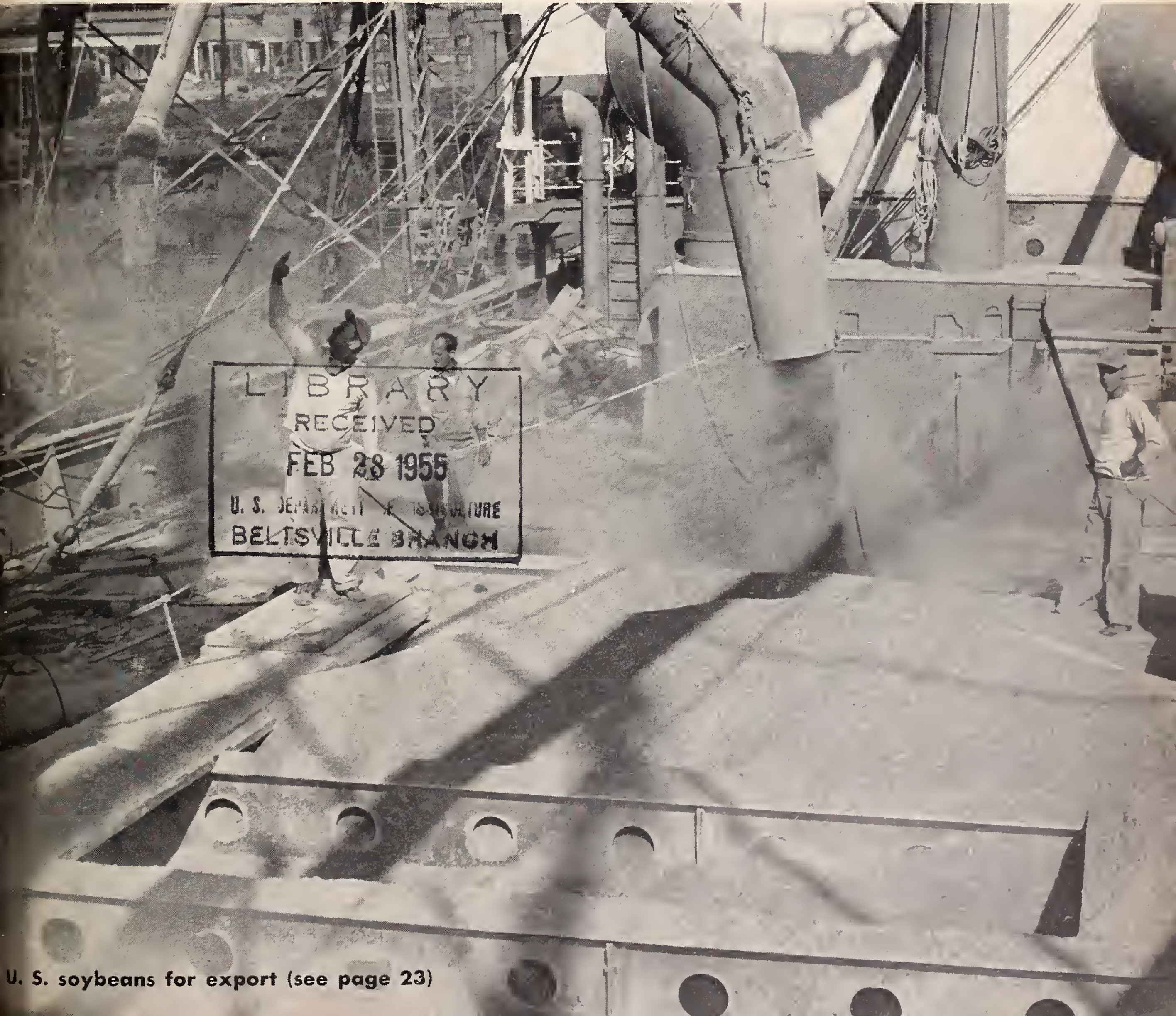

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U. S. soybeans for export (see page 23)

Foreign Agriculture

Vol. XIX • *FEBRUARY 1955* • *No. 2*

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FRONT COVER

U. S. Soybeans for Export

U. S. soybeans, destined for foreign ports, flow into the hold of a ship at New Orleans. This year, in Western Europe—the world's best commercial market for fats and oils—our soybeans are reportedly meeting heavier competition than they did last year. (Port of New Orleans photo.)

BACK COVER

U. S. Imports and Exports of Fats, Oils, and Oilseeds, 1950-54

The United States has now become a major exporter of fats and oils. Shipments have been trending upward over the past 5 years, reaching an estimated 1.8 million short tons last year.

NEWS NOTE

Annual Conference for Agricultural Service in Foreign Areas

The Conference for Agricultural Services in Foreign Areas will convene in Washington February 7-10 to make its annual review of the program for training foreign agriculturists in this country, the progress and problems of sending United States agricultural technicians on foreign assignments, and the contracts between our land-grant colleges and governments and educational institutions in other countries.

The Conference is jointly sponsored by the U. S. Department of Agriculture and the Foreign Operations Administration (FOA).

Since the inception of the United States economic cooperation programs in the late 1940's, some 4,500 agricultural observers and students from Europe, Latin America, Africa, and the Near and Far East have participated in training programs, most of them at land-grant colleges and universities. During these years, hundreds of United States agricultural technicians have served in overseas advisory posts: now, around 725 are abroad, mostly on 1-and-2-year assignments for FOA. The contracts between land-grant colleges and foreign countries or universities dealing with improved agriculture or agricultural education now number 24 but involve only 22 colleges.

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FOREIGN AGRICULTURE ALICE FRAY NELSON, EDITOR

A monthly publication of the Foreign Agricultural Service of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Director of the Bureau of the Budget (October 28, 1953). Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 15 cents per copy, or by subscription at the rate of $1.50 per year, domestic; $2.00 per year, foreign. Postage stamps will not be accepted in payment.

Supply of Fats and Oils in 1955

Steady world demand, combined with orderly marketing of excess supplies in the United States, is likely to assure a stable market in 1955.

by PAUL E. QUINTUS

The world will have plenty of fats and oils in 1955, although supplies will not be excessive. Both edible and industrial fats and oils will be in ample supply. Moreover, demand is expected to continue steady, and prices in world markets seem likely to remain relatively stable at least until new-crop oilseeds in late 1955 begin to come to market.

The late 1954 harvests of oilseed crops were generally good except for the sharply reduced "off year" crop of olives in the Mediterranean Basin countries —which means less olive oil in 1955.

True, complete information is lacking about the supply situation in China, especially Manchuria, and the vast area of the world that lies behind the Iron Curtain. But indications are that 1954 oilseed crops in surplus-producing China, at least, were somewhat bigger than in 1953. Whether exports from there to free-world markets in 1955 will be greater than last year is problematical.

As for the oilseed crops that will be harvested in the next 3 to 4 months, there is no evidence of serious deficiencies anywhere except possibly in Argentina, where there is a deficit in edible oil because of reduced sunflower-seed harvests. The outlook for production in 1955 of other vegetable oil-bearing materials—primarily copra, coconut oil, palm oil, and palm kernels from tropical areas—is favorable. Production of animal fats—lard, tallow, greases, and butter—is expected to be as large as in 1954. And while output of the marine oils—whale, sperm, and fish—may not come up to last year's high level, production probably will be ample.

The world is now believed to consume fats and oils at a rate of about 27 million short tons annually. This estimate is predicated on the economic maxim that the world consumes what it produces.

Mr. Quintus is Director, Fats and Oils Division, FAS.

North America

The United States, the world's leading exporter, will set a new record in the production of fats and oils in 1954-55, taking into account the oil equivalent of exported oilseeds. This output, estimated at more than 6.7 million short tons, oil equivalent, may permit United States exports in 1954-55 to repeat the record level of 1.7 million tons established in 1953-54. This prognostication assumes the continuing sale for export of large quantities of cottonseed oil, linseed oil, and flaxseed from stocks held—or to be acquired—by the Commodity Credit Corporation (CCC).

The major United States export items are soybeans and soybean oil, cottonseed oil, linseed oil, lard, tallow and greases, and fish oils; and the principal markets for them are Western Europe, Japan, and North and South America.

With the 1954 soybean crop 15 percent higher than the previous record of 1950, exports of soy-

Cases of U. S. lard move into the hold of a freighter. Lard shipments abroad this year are expected to exceed those of last year, for our production is up.

beans may surpass by one-fourth the record quantity of beans exported a year ago. And although cottonseed output was down 17 percent from the year before, exports of cottonseed oil—partly from CCC supplies—are expected to exceed the heavy volume exported last year; this prospect arises as the result of decreased supplies of olive oil in Mediterranean countries. Flaxseed outturn increased 13 percent and, since production is well in excess of domestic requirements, exports of linseed oil—and flaxseed—are again expected to be substantial, although well below the volume of last year, when CCC virtually liquidated its holdings of oil from the crops prior to 1953. With an appreciable increase in lard production, exports probably will exceed last year's relatively low level. Shipments of inedible tallow and greases, reflecting a new record of output, may approximate last year's high level. And with output of fish oil expected to surpass last year's volume, exports may approach the record of 1954.

Canada's oilseed crops in 1954 were considerably bigger than those of the year before. With flaxseed production estimated at 11 million bushels, an increase of 14 percent from 1953, the prospect for increased exports in 1955 of linseed oil—and possibly flaxseed—appears good. The oil from the larger rapeseed crop again is expected to find its major market in the United States. Although soybean production at 5.1 million bushels set a new record, considerable quantities of beans and cottonseed oil again will need to be imported from the United States.

South America

With the preliminary estimate of Argentina's flaxseed production at 18 million bushels—an increase of 15 percent from the 1953-54 crop—prospects appear good for substantial exports of linseed oil in 1955. However, shipments are not likely to approach those of 1954, when the Argentine Trade Promotion Institute (IAPI) sold for export virtually its entire holdings of oil from previous years. Although the acreage planted to sunflower seed in 1954-55 was expected to exceed the relatively small acreage harvested last year, indications are that the crop may be even less than in 1954, when the output was the smallest in 15 years. For this reason the deficit in edible oils in Argentina, normally a surplus producer, is expected to continue into 1955-56. However, there is assurance for the time being of a market in the United States for a large share of the Argentine production of 14,330 tons of industrial oil from the 1954 tung crop.

In Uruguay, indications are that flaxseed production again will be relatively small, perhaps even less than the 2.5 million bushels harvested in 1954. It is too early to foresee whether Brazil's oilseed crops in 1955 will exceed output in 1954, when the rather marked increases from a year earlier in the production of cottonseed, peanuts, soybeans, and castorbeans were accompanied by further declines in production of babassu kernels and oiticica seed. At any rate it seems probable that with the economy of Brazil continuing to expand, exports of fats, oils, and oilseeds from that country will continue to diminish.

Africa

The Continent of Africa, rich in oil-bearing ma-

Inedible tallow is piped into the tanks of a Japanese vessel at Houston, Texas. Japan is one of our best markets for fats and oils.

terials, is a major source of peanuts and oil, palm oil, and palm kernels. However, in French West Africa the 1954 peanut crop was considerably smaller than the near-record 1,050,000 tons harvested a year earlier. Moreover, the quality was inferior. In Nigeria, too, the recently harvested peanut crop was expected to be somewhat smaller than in 1953.

The 1955 outlook for a continuing high level of production of palm oil and kernels in Africa is good. It is so particularly in those areas, such as Nigeria and the Belgian Congo, where the system of premium payments has resulted in the increased output of edible-grade palm oil.

Asia

In certain of the countries comprising the vast expanse of Asia is produced a large share of the oils and oil-bearing materials that are consumed by the world's peoples. Owing to increased population in India and Indonesia, and to political circumstances there and elsewhere—particularly in China—surplus oils and oil-bearing materials from these countries have not been traded in as large volume as before World War II. But indications are that the volume of oil-bearing materials moving from the Far East in 1955 may be about the same as in 1954.

In India the outlook currently is favorable. Peanut output is not likely to exceed last year's estimated production of 4.2 million short tons despite a modest increase in acreage planted, but sesame output is expected to increase, perhaps enough to be commensurate with the moderately higher acreage sown. With a substantial carryover from the good crops of the 2 previous years, exportable supplies of Indian peanuts are expected to be the largest in recent years. Whether the Indian Government will accede to the requests of shipping interests for substantial increases in export allocations—with a portion of the allocations in the form of peanuts rather than oil—may depend on the need for stabilizing domestic prices. In view of the favorable supply outlook for vegetable oils—as reflected by the abolition in recent months of the export duties on rapeseed, mustard, cottonseed, niger seed, kardiseed, and linseed oils—there is hope in some quarters that the Indian Government will permit limited exports of sesame oil. Flaxseed output is expected to reflect some cutback in acreage planted, but it is too early to predict whether the output of castorbeans will be in the neighborhood of last year's 120,000 short tons.

China's oilseed harvests in the fall of 1954 are believed to have been slightly bigger than those of a year earlier. Whether exports from that country in 1955 will reflect earlier indications that production of soybeans, peanuts, rapeseed, and sesame would be higher is problematical. Unofficial reports are that high-quality soybeans are being offered in West European markets in larger quantity than last year and at prices below those from the United States.

From the Philippine Republic, Indonesia, Ceylon, and Malaya, copra and coconut oil supplies may—in the absence of typhoons and other adverse weather—approximate the relatively favorable supply levels of 1954. In the Philippine Republic, a new program to improve the quality of copra is scheduled to go into effect May 1, 1955, but the question has been raised by some as to whether this program might cut exports. Palm oil and kernel supplies from Indonesia and Malaya are expected to be about the same as those of last year.

Europe

Western Europe's output in 1955 of animal fats —butter, lard, and tallow and greases—probably will equal or slightly exceed that of 1954. It is too early to foresee the outcome of the fall-planted rapeseed crop. But whether production of fish oil will come up to last year's favorable level is doubtful, although output of whale oil by the various expeditions in the Antarctic during the pelagic season that began January 7 may not differ greatly from the levels of recent years.

The countries of Western Europe will continue to rely primarily on imports for their supplies of fats and oils. In this market, the world's largest commercial market for fats and oils, first priority is given sales from the overseas territories and possessions, primarily in Africa and the southwest Pacific Islands; but a sizable share of the market again will be won by the United States and other dollar-trading countries, including the Philippine Republic and Canada.

Australasia

No significant change is foreseen in the quantities of butter and tallow that will be produced in 1955 in Australia and New Zealand, although output of butter may be slightly higher. And important quantities of copra from the many islands in the southwest Pacific will continue to move to European markets, especially the United Kingdom.

Summary

Thus, it looks like another good year. But, again, supplies are not excessive. There'll be plenty of edible oils for the manufacture of margarine, shortening, and cooking and table oils. There'll be adequate supplies of soft oils to blend with and "stretch" the reduced output of olive oil in the Mediterranean countries. There'll be sufficient supplies of edible animal fats—lard, tallow, and butter—for cooking purposes and spreads for bread. Finally, there'll be adequate supplies of industrial fats and oils for the manufacture of steel, terneplate, soaps, paints, varnishes, lacquers, linoleum, printer's ink, and numerous other items. And should any country find itself short of supplies, the United States Government, through the CCC, stands ready to sell at world prices cottonseed oil from its diminishing stocks, also butter, and, perhaps later in the year, linseed oil and flaxseed.

Haiti Makes Bottled Milk From U. S. Milk Powder

Americans visiting Haiti this spring will be able to buy whole bottled milk of United States origin. About 1 of every 6 quarts sold in Port-au-Prince now is recombined milk, which 2 new plants are processing there from milk powder and butterfat that have been shipped from the United States.

One of the new plants, the Usine à Glace Nationale S.A., has a daily capacity of 500 quarts of recombined milk and the other, the Red Rose Ice Cream Co., has an 800-quart capacity. Thus, together the two plants (both financed entirely by Haitian capital) add 1,300 quarts of fluid milk to Port-au-Prince's available supply. This supply the Haiti Institut de Statistique estimates as approximately 6,500 quarts a day during the dry season from February to May (which includes most of the tourist season).

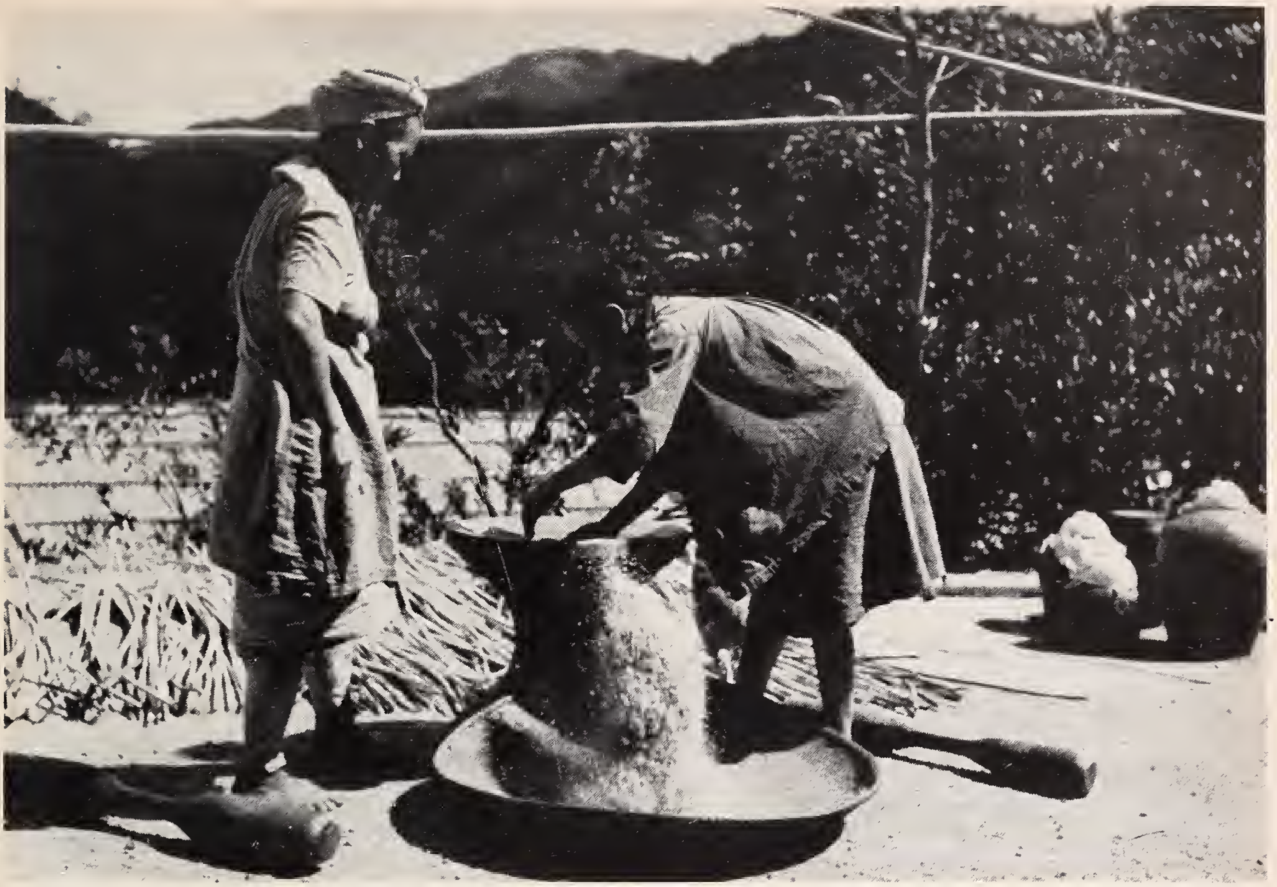
The product of these plants retails at the reasonable price of 20 cents a quart, or less than the price of locally produced milk, either raw or pasteurized. Haiti has four plants that pasteurize and bottle the local milk for sale at 22 cents a quart through home delivery and retail stores. However, much of the milk consumed in Port-au-Prince—and probably in other urban areas also—is sold raw on a door-to-door basis: it may be ladled from the vendor's milk can into the customer's container, or even produced on the spot by the vendor's cow.

In addition to recombined milk and the fresh milk produced locally, Haiti's monthly supply has included as much as 380,000 pounds of imported fresh milk and probably about 250,000 pounds of imported whole milk equivalent (in the form of whole milk powder and condensed and evaporated milk). Of the $345,000 that Haiti spent during 1953 in importing processed milk products, the Netherlands received 37 percent, the United States 35 percent, and Canada 28 percent.

But Haiti could use much more fluid milk. Even with the output of the new recombining plants, there are only 7,800 quarts a day available for all of the 200,000 inhabitants of Port-au-Prince—about 1 quart per person every 4 weeks. There are probably similar milk shortages in other urban localities, such as Jacmel with its more than 100,000 people, Aux Cayes with its 75,000, Gonaives with its 65,000, St. Marc with its 55,000, and the several other cities with populations of more than 10,000.

This potential demand, plus the fact that the recombined milk has won consumer acceptance, offers a wide opportunity for expanding the output of this product throughout Haiti. And such an expansion, in turn, offers a wider market to United States exporters of milk powder and butterfat—the raw materials of this new industry.

—Terrence W. McCabe of FAS's Livestock and Livestock Products Division, and Donald L. Woolf, Attaché, American Embassy, Port-au-Prince, Haiti.



These Formosan women have just finished husking rice by pounding it in the stone "polishing" bowl with the mauls shown on the ground. This method preserves some of the husk, or bran, and with it much of the vitamin content.

Rice and Health in Asia*

By ROBERT R. WILLIAMS

The relationship of rice to public health in Asia may seem remote from the modern synthetic chemical industry of the United States; in fact, there are conservative souls who still insist that it is quite remote. I beg to present some evidence that it is not, and that chemical synthesis may well prove to be the key to major aspects of certain nutritional problems.

Most of Asia's population, some 800 million people, derive about two-thirds of their daily calories from rice, mostly white rice. The obvious corrective for its whiteness—and for the low vitamin content that goes with its whiteness—is to leave some of the bran on it. This solution has been preached up and down the coasts of Asia for 44 years with little effect except in Japan and perhaps to some extent in Indonesia. The rice for Asian cities grows whiter as the cities grow in size and industrialization.

Once most Asians lived on farms and grew their own rice. Their women daily pounded off the hulls and some of the bran in their dooryards and put the rice in the cooking pot the same day. Rice so undermilled lost little of its nutrients. Today a great many Asians work in shops and factories and get their rice from hundreds or thousands of miles away; and rice that comes from such a distance must be thoroughly milled or it will be

Dr. Williams is Chairman, Williams-Waterman Fund for the Combat of Dietary Diseases, Research Corporation.

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* Adapted from an address given on November 8, 1954, to the National Academy of Sciences.

rancid and full of weevils before it reaches the consumer.

Undermilling of rice under government supervision has been fairly successful in Japan during the past 15 years because the country is widely electrified and little rice mills operate in every neighborhood. During the war these mills became the government rice-rationing centers and no woman had to walk more than a mile to get her day's supply. Of course she got it fresh.

In the more primitive parts of Asia, for example in the hill country of Burma and Indochina, the old hand-pounding practice still remains. It does so also in much of Indonesia, where there are no big mills and few factories for industrial employment.

In India the practice of parboiling saves some of the vitamins for the consumer. The rough rice is soaked several hours or overnight in hot water and then dried in the sun. This steeping, which loosens the hulls, saves a lot of work—the advantage that doubtless explains why the Indians' ancestors adopted the practice in the first place. Not until 1928 was another advantage discovered: that the water, in passing through the bran coats, carries half the vitamins and some minerals into the interior of the grain, where they remain after the rice is milled. Of course the operation often is not performed in sanitary fashion and the final product suffers modification of flavor, color, and ease of cooking. In addition, costs are high where climate prohibits sun-drying. For such reasons the use of parboiled rice has remained confined to Indian peoples. India still parboils 60 percent of its rice; no other country parboils except for the use of Indians. An exception is the United States, where modernized parboiling processes are in use for 20 percent of the rice we consume, which incidentally is only 6 pounds per capita per year—a tiny amount compared with Asia's 300 pounds.

Enriching rice with synthetic vitamins is one way of combating the nutritional deficiencies that appear wherever white rice is the major part of the diet. In the Philippine Republic, for instance, where the thiamine-deficiency disease beriberi has been the second cause of death for 40 years, an experiment with artificially enriched rice was begun in Bataan in 1948, with 60,000 people, under the direction of the Secretary of Health, Dr. Juan Salcedo. To enrich the rice the same machinery and methods were used that had been devised for enriching cornmeal in our South for prevention of pellagra and that now are being successfully used also in Yugoslavia. The cost of enrichment in Bataan—35 cents per person per year—was subsidized during the experimental period, which lasted a year and a half. At the end of that period beriberi mortality had fallen to zero!

Bringing enriched rice to larger areas in the Philippines on a self-supporting basis has gone more slowly because the cost of enrichment is reflected in an increased price for the finished rice. Since the poorer and more ignorant housewife will inevitably buy the cheaper unenriched rice, it has been necessary to prohibit by law the sale of that rice. Under Dr. Salcedo's leadership such legislation was enacted on a bipartisan basis by the Philippine Congress in 1951, with the proviso that it should take effect in each province on proclamation by the President. Time was thus provided for 5,000 Filipino rice millers to receive instruction and to install mixing equipment.

The first proclamation was made in 1950-51 in two leading rice-producing provinces, as well as in Bataan, which is barely self-sufficient in rice. The law could not be enforced, not because there was popular protest concerning increased cost but because no government agency was willing to distribute the premix to locations convenient to the millers. The premix is highly fortified rice coated to prevent removal of the vitamins by cold water washing, a practice universally followed by the women in preparing rice for cooking. The premix, manufactured under a chemist's control in Manila, is shipped to the rice mills, where it is mixed with the white rice stream in the proportion of 1 to 200. Cheaper grades of white rice in the market cost 80 centavos per ganta (40 cents U. S. currency for 5¼ pounds). As enriched rice of the same grade sells at retail for only 41 cents, the increase is no great handicap.

In August of 1954 President Magsaysay proclaimed a schedule that will make the rice enrichment law effective in every city and province of the country by the end of 1956. Even more important, he has sanctioned the manufacture and distribution of the premix by private enterprise. This will put the profit motive to work under regulations requiring government approval of any increase above present prices. It is hoped that rice enrichment will now go forward rapidly, for the rice miller will no longer have any defense if

This little Indian girl, like most other Asians, has a simple diet, largely of rice. Much of the rice eaten in her country is parboiled before it is milled, and for that reason retains many of its nutrients.

he is caught in a violation of the law.

Of course, it will be necessary for the government to carry on inspection and to prosecute millers or merchants who violate the law. To do so might well be impossible from a political standpoint if the enriched rice were unpopular in appearance or flavor or if the cost differential were substantial. With the present scheme of distribution both the premix vendor and the rice miller will make a little extra profit on the enrichment of the rice. Under these circumstances only occasional violations are expected from deliberately unfair competitors. By the very nature of the law and of the rice trade, enforcement must be nearly complete if it is to succeed at all. The price advantage of illicit trade in unenriched rice is sufficient to permit the violator to underbid by a narrow margin on all rice sales contracts. But if the law is rigorously enforced, we can expect to see beriberi abolished from that area within 3 years.

All of rice-eating Asia suffers more or less from beriberi and related disorders. Extending the use of enriched rice will be greatly slowed by shortage of dollars with which to buy the vitamins, but this deterrent can be overcome in time by increased freedom of trade and currency exchange. With reduction of present restrictions, the vitamins can ultimately be manufactured in Asia. Indeed, the Japanese are already producing them in significant quantities. A demonstrated success in the Philippines may therefore usher in a new era.

Beriberi is not the only disease that can be eradicated by a proper fortification of rice. In Formosa, the most striking deficiency is of riboflavin rather than of thiamine. We in Western countries get our riboflavin largely from milk; but in Asia this commodity inevitably will be in short supply for generations to come, for land is not available for large-scale dairying. Although increased crop yields are possible in many areas with better agriculture, more fertilizers, and greater conservation of water for irrigation, these improvements require vast investments of capital and skill. India, in particular, faces Malthusian disaster in the not distant future unless every resource is tapped.

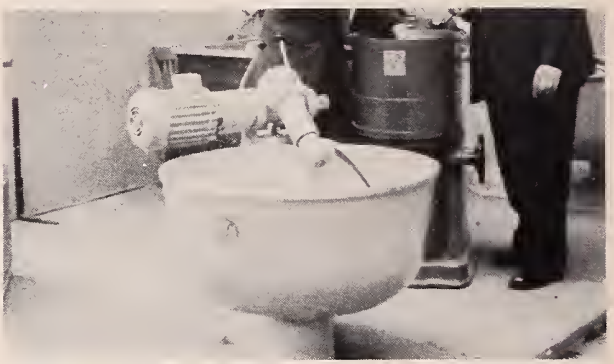
What can be done by chemical manufacture to meet this situation kindles the imagination. Two-thirds of the human race habitually suffer from an insufficiency of good quality protein such as we derive from animal foods. Now we know that the vegetable proteins, which are cheaper and which can be produced on one-seventh of the acres required for producing animal feeds, are equally good for human beings except that they are short in three or four of the essential amino acids. These amino acids, however, can be produced by chemical synthesis. Several of them already are being made commercially in the United States for supplementing animal feeds. They can be added to rice in Asia by methods analogous to those now being used with vitamins. The quantities required daily will be 10 to 100 times larger than those for vitamins, and the costs will be correspondingly higher; besides, we need more knowledge of what balances must be preserved among the various amino acids in the basal diet.

Paris Shows What's Equipment for French

French manufacturers of equipment for the processing and merchandising of food are making a strong effort to help France's food industry and trade streamline the traditional production and distribution methods.

This effort was evident from the quantity of sleek modern machinery that was on display at the 1954 show held in Paris by the French manufacturers of food industry equipment. From November 3 to 11, the Parc des Expositions at the Porte de Versailles was host to four simultaneous exhibitions. One was a showing of equipment used by raw-material processors (such as flour mills, sugar mills, and slaughterhouses) and by makers and distributors of finished food products (such as delicatessens, groceries, bakeries, confectionery stores, butchershops, and wineshops). Another exhibition was especially for the dairy industry. The last two covered the equipment used for packing and handling and for bottling.

Especially interesting to many United States



Large mixers like this are used to knead the dough for the bread made in French bakeries. This exhibit was part of the 1954 showing of equipment in France's food industry.

This exhibit of equipment for the French dairy industry shows some of the products of one firm. At the left is machinery for bottling sterilized milk; at the right is a display of equipment for use in dairy laboratories.

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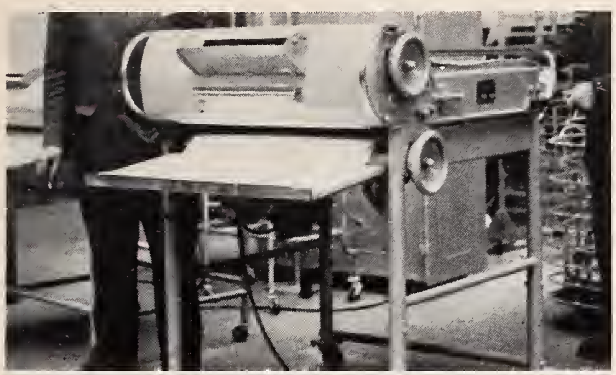

This machine, here shown on display at the Paris exhibition of food-industry equipment, molds bread dough into the long loaf that is known in this country as "French" bread.

viewers were the merchandising methods French businessmen are devising, as revealed in the striking displays. French food-trade associations, in competition for the housewife's franc, entered in the exhibition several model stores with highly effective floor plans, lighting, and showcase arrangements. French food processors, too, are interested in presenting their products to the best possible advantage, and many of the machines on exhibit demonstrated that the French are alert to new ideas for packaging and labeling foods.

Exhibits of equipment for the laboratories maintained by grain mills, sugar mills, and dairies were evidence of the high standards France is developing in food processing. It was evident, too, that these laboratories work closely with the industries that use the food products. For example, the French Institute of Milling prepared both the exhibits of laboratory equipment for the grain-milling industry and the exhibits of specialized machines for the bakeries using the various types of flour.

Attractively displayed here are milk cans and bottles of the type manufactured in France for the dairy industry. The same firm also makes racks for sterilizing the bottles, and many other types of equipment for milk and cheese processing.

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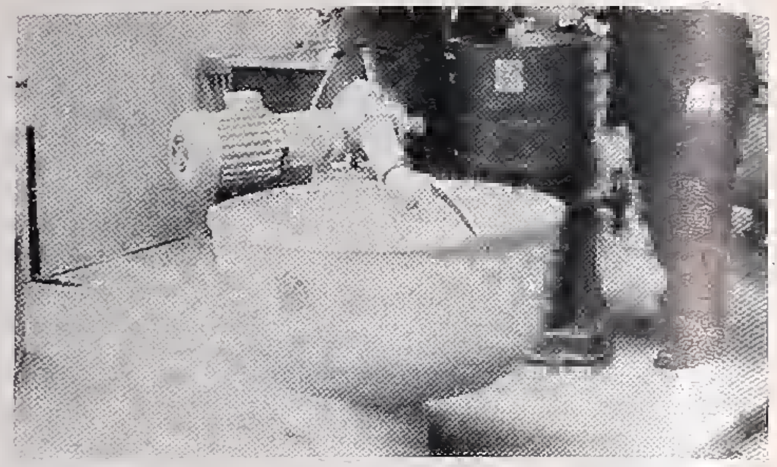
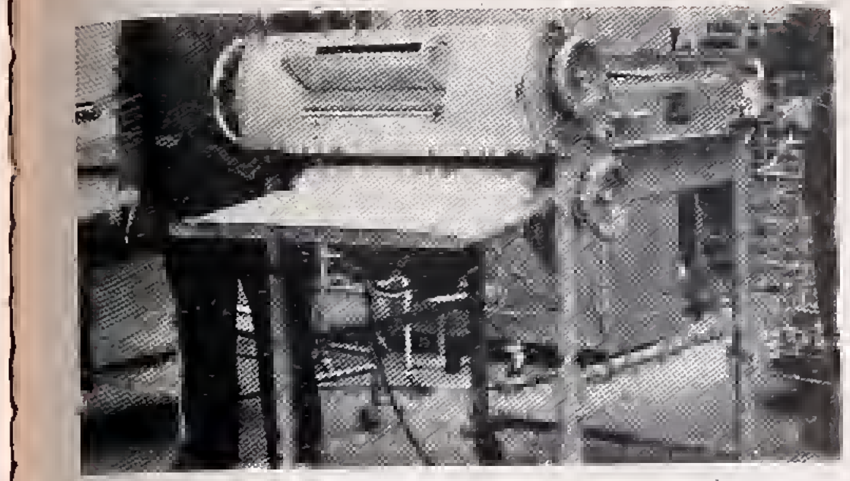

Large mixers like this are used to knead the dough for the bread made in French bakeries. This exhibit was part of the 1954 showing of equipment in France's food industry.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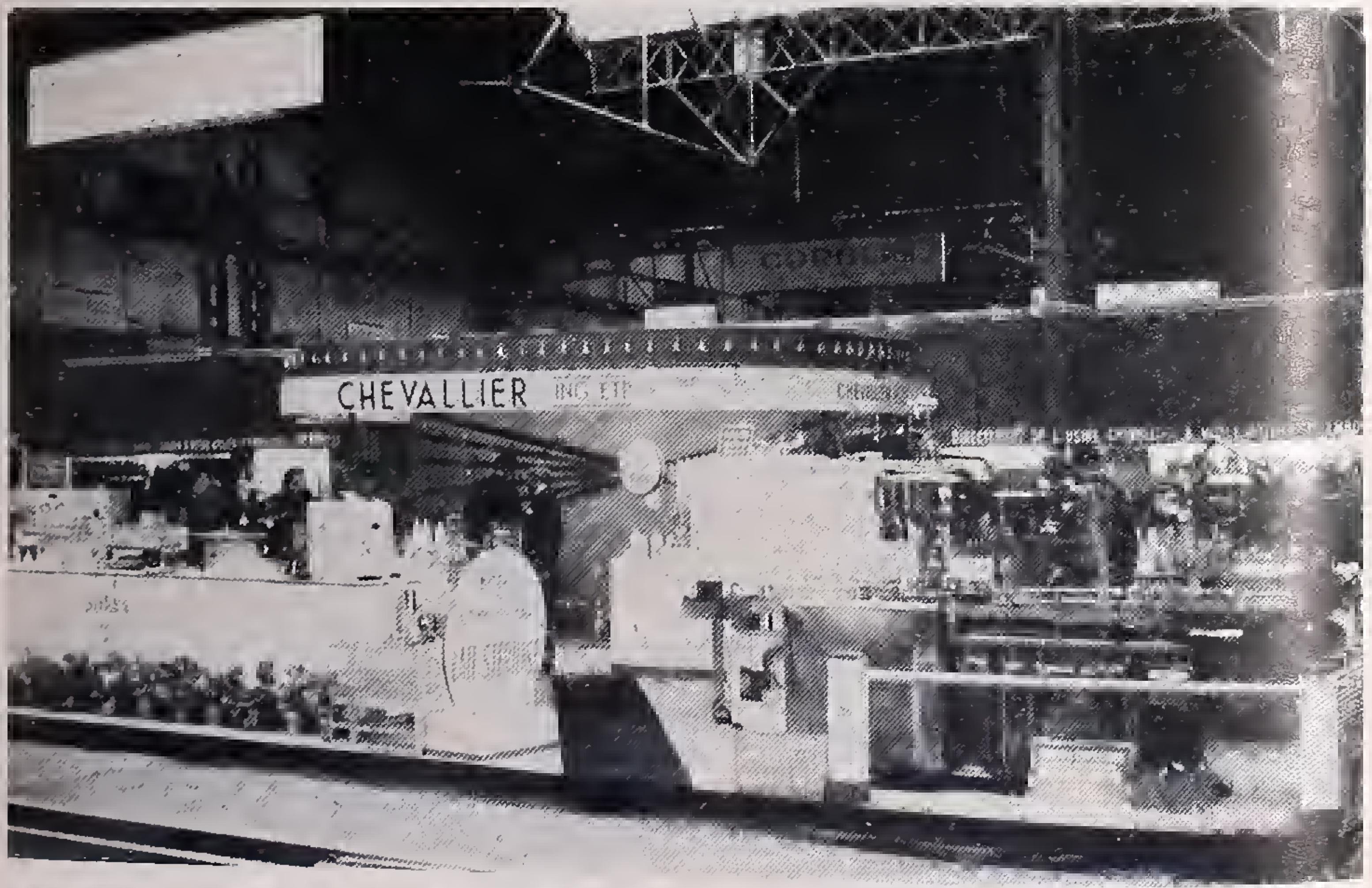

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More fertilizer seems to be one of the principal answers to Pakistan's problem of how to grow enough food grains for its ever-increasing population.

Pakistan's Food Problems And Fertilizer Requirements

By CLARENCE E. PIKE

The area that is now Pakistan was once called the breadbasket of undivided India; but in several recent years it has not produced enough food grains (cereals and grams and other pulses) to feed its own people. Right now the supply of food grains is fairly satisfactory, thanks to an exceptionally good crop in 1953-54, but in 3 out of the past 5 years—in fact, in 4 out of its 7 years as an independent country—Pakistan has had to import substantial quantities of these foods to supplement production.

Its population is growing fast—faster than the rate at which new land is being brought under cultivation—and since the war the yields per acre have been lower than they were before. This combination of circumstances strikes at the well-being of Pakistan's people, for whom food grains have always been the basic foods. Their per capita consumption is one of the lowest in the world: in 1952 it was only 1,732 calories a day, 78 percent of which were food grains; and during 1950-54 each person averaged only 330 pounds of food grains a year.

The economy of Pakistan is largely agricultural and between 85 and 90 percent of the people depend on agriculture for a livelihood. In the rural areas the economy is largely one of barter: the people grow what they eat and eat what they grow; and the purchases they make of goods produced beyond the village are largely limited to such necessities as cloth and salt.

Most of the total crop area—83.5 percent in recent years—has been given over to food grains; a little is devoted to other food crops, principally oilseeds and sugar; and the remaining small percentage is used to grow commercial crops, largely for export. These commercial crops—jute and cotton chiefly, but also tea, hides, and skins—have been earning nearly all of the country's foreign exchange. Besides furnishing hides and skins, livestock are important to Pakistan's economy as a source of draft power; but on a per capita basis they produce very little of meat or dairy products.

Pakistan's problems are complicated by the fact that the country is divided into two parts—East and West Pakistan—which are separated from one another not only by a thousand miles of Indian territory but also by marked differences in soils, climate, language, and culture.

West Pakistan is by far the larger, with 310,000 square miles against East Pakistan's 55,000, and with 31 million acres under cultivation against East Pakistan's 20 million. In the days when it was part of India, West Pakistan supplied that country with grains, as well as with cotton for the textile mills in Bombay and Ahmedabad; and, although it contained practically no industry, it was considered the most prosperous region in the Indian subcontinent. East Pakistan supplied most of the jute for the mills around Calcutta.

In most parts of West Pakistan rainfall is low and irrigation is necessary to crop production; about 80 percent of the cultivated land is irrigated. In East Pakistan, however, rainfall is high and very little irrigating is done.

Pakistan is the seventh most populous country in the world. In 1950-54 the population averaged 76.6 million, or nearly 210 people per square mile. Distribution of this population, however, is extremely uneven. East Pakistan, for instance, which has only 15 percent of the land area, has 56 percent

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of the people. West Pakistan, not so congested, has somewhat higher living standards, but in practically every part of the country the population has caught up with the land's productivity under prevailing farm practices.

The population has been increasing steadily over the last half century. In 1901 it was 47.4 million; 50 years later, 75.7 million. If the present officially estimated rate of increase—1¼ percent every year—continues, population may reach nearly 86 million in 1961, 97 million in 1971, and 110 million in 1981. And, considering the public health measures now under way, it may grow even faster.

Unfortunately, this steady increase in the population over the last half century has been unaccompanied either by a proportionate increase in the cultivated area or by any substantial improvements in farm practices. Can Pakistan hope to produce the food that will be needed by such large populations in the future? Can it increase production, not just to keep pace with the growing population but to feed its people more adequately? The questions call for an examination of the possibilities.

Considerable thought has been given to the possibilities of expanding the cultivated area, but the possibilities in this direction are limited. Careful studies in East Pakistan, where the pressure of population on land resources is most intense, indicate that the maximum area that could possibly be added through reclamation is 6 million acres. Even after reclamation, however, much of this land would still be of poor quality; and this fact, together with the extremely high cost of reclamation, has brought Pakistan officials to the conclusion that it would not be economically feasible to reclaim more than 1.5 million acres in East Pakistan. The cost of reclaiming this land, it is generally agreed, would be equivalent to 250 million United States dollars.

In West Pakistan, any substantial expansion of cultivated area is dependent upon extending irrigation. Recent surveys indicate that there are several million acres that could be brought into production if they could be adequately irrigated. Already an extensive network of canals irrigates some 18 million acres with water from the 5 major rivers of the Indus basin, which are fed by melting snows and heavy rains in the Himalayas; and several million more are irrigated from wells or from canals that catch water when the rivers are at flood stage. Although the entire flow is already utilized during the winter, when most crops are grown, there is a large surplus of water during the summer runoff that could be used to irrigate additional land if storage reservoirs were constructed. Also, there appears to be sufficient underground water in some areas that could be used to irrigate a substantial additional acreage from wells.

Several projects, a few major and many minor, for increasing the area under irrigation in West Pakistan are now in various stages of planning or

TABLE 1.—Cultivated area in food grains, population, and food-grain requirements, production, and deficit in Pakistan, averages for 1935-39 and 1950-54 and projected averages for 1960-64 to 1980-84

Period	*Cultivated area*			*Population* [2]	*Food-grain requirements*		*Net food-grain production* [3]	*Food-grain deficit*
	Total	*In food grains* [1]						
		Million acres	*Percent of total*		*Per capita*	*Total*		
	Million acres			*Millions*	*Pounds*	*1,000 short tons*	*1,000 short tons*	*1,000 short tons*
1935-39	45.4	36.3	80.0	66.0	350	11,550	11,550	—
1950-54	50.4	42.1	83.5	76.6	332	12,700	12,450	250
1960-64	55.0	44.0	80.0	86.8	350	15,200	13,000	2,200
1970-74	60.0	48.0	80.0	98.3	365	17,850	14,200	3,650
1980-84	60.0	48.0	80.0	111.3	365	20,300	14,200	6,100

[1] Estimates of the area in food grains, which include cereals and grams and other pulses, are based on the assumption that 80 percent of the cropland will be devoted to food grains. [2] Population estimates are on the basis of an annual increase of 1¼ percent. [3] Production estimates are on the basis of average yields in 1950-54; they reflect adjustments for seed, industrial uses, and unavoidable losses.

construction. If all are carried through to completion, they will add more than 7 million acres to the irrigated farmland of that part of the country. Progress is slow at best, and many years will be required to complete these projects; but they do offer encouragement.

Certain of the irrigated areas in Pakistan, particularly in the Punjab, suffer from salinity and water logging of the soil. A recent survey indicates that for this reason approximately 35,000 acres go out of cultivation every year. Several projects for reclaiming saline lands are under way, but they are limited in their effectiveness by shortage of water for flushing out the soil. Some progress is expected, but it appears doubtful that more saline land can be reclaimed than is being forced out of production.

All in all, then, with the reclamation and agricultural techniques now available, an expansion of about 8½ million acres—or perhaps even 10 million—is about what can be considered economically feasible for all Pakistan. Careful study has led to the conclusion that if a program of reclamation is vigorously pursued, such an expansion can be achieved in the next 20 years, with 5 million acres added per decade, bringing the total cultivated area to something like 60 million acres by the early 1970's.

But this increase in cultivated area will not in itself be enough. It will have to be augmented by increases in yields per acre, or the country's struggle to produce food for the growing population will be a losing one. In the 15 years that have elapsed since 1935-39, both the cultivated area and the percent devoted to food grains have increased—the former by 11 per cent and the latter by 3.5 percent—but the average yields per acre have declined, with the result that the average annual production has increased by only 6 percent. This circumstance, in the face of a 16-percent increase in population, has brought the average annual food-grain availabilities down from 350 pounds per capita to only 332 pounds, even with the aid of imports averaging 250,000 short tons a year in 1950-54 (see table 1).

TABLE 2.—Estimated food-grain and fertilizer requirements in Pakistan, 1950-54 to 1980-84

Period	*Estimated food-grain[1] requirements*	*Increment in food-grain requirements over 1950-54*	*Estimated chemical fertilizer required to produce one-half of food-grain increment[2]*	
			Nitrogen	*P_2O_5 and K_2O*
	1,000 short tons	*1,000 short tons*	*1,000 short tons*	*1,000 short tons*
1950-54	12,700	—	—	—
1960-64	15,200	2,500	100	50
1970-74	17,850	5,250	210	105
1980-84	20,300	7,600	304	152

[1] Food grains include cereals and grams and other pulses.

[2] It is assumed that the other half of the increment can be met from expansion of the area sown, improvements in irrigation, improved seeds, and all other improvements in cultural methods other than use of fertilizer.

Further emphasis of the need for increased yields per acre is found in the consideration that the recent increases in the percent of cultivated area devoted to food grains (from 80 percent in 1935-39 to 83.5 percent in 1950-54) do not constitute a desirable trend. For its foreign exchange the country is almost entirely dependent on exports of such agricultural products as jute, cotton, and tea; and for the foreseeable future—at least until the country's current industrialization program cuts down the necessity for certain imports and produces manufactured items for export—Pakistan must vigorously seek foreign markets for those agricultural products and grow those products in sufficient volume. Moreover, other crops besides food grains should be grown in enough quantity to give the people certain essentials and some variety in their diet and to provide raw materials for the growing industries. Over the long run, therefore, it seems best not to have more than 80 percent of the cropland in food grains.

Assuming that only 80 percent of the cropland is in food grains, it is not difficult to measure how inadequate would be those 5-million-acre increases in cropland for each of the next 2 decades if the population continues to grow at the conservatively estimated current rate. In 1960-64 Pakistan would have 55 million acres in cultivated land and an average population of 86.6 million. If no increase in the 1950-54 average yields should occur and consumption should return to the prewar level of 350 pounds per person, production would fall 2.2 million short tons behind requirements and the country would have to resort to imports to that extent; and even if yields should be restored to the prewar level, the deficit would be 1.2 million tons, 5 times as much as in 1950-54. In subsequent years

A team of oxen furnishes the power for a threshing job in Pakistan. In that country one of the principal uses for livestock is as a source of draft power.

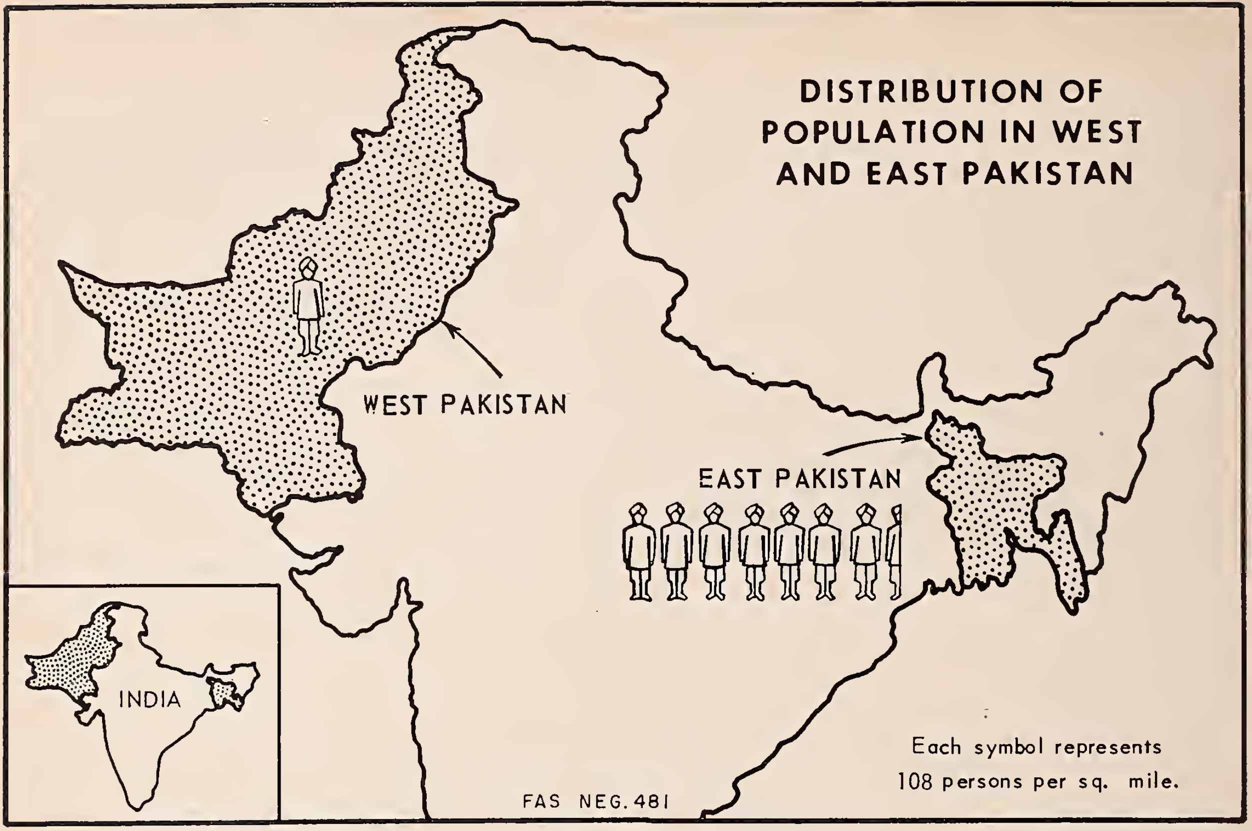
the deficit would become progressively greater; and by 1980-84, with a cultivated area of 60 million acres producing at the 1950-54 yields, only 14 million tons of food grains would be produced—6 million tons less than what would be required for 110 million people if each consumed at the desirable level of 365 pounds per year.

But the food outlook 10 to 30 years hence need not be discouraging if known and proved methods of increasing the yields per acre are widely adopted by Pakistani cultivators. Certainly there is plenty of room for improvement, for throughout Pakistan the crop yields are extremely low. For example, during 1950-54 the average acre of rice produced only 850 pounds a year, milled basis, a figure that contrasts sharply with averages of 2,100 pounds in Egypt, 2,300 pounds in Japan, and 3,200 pounds in Italy. And wheat yields for the same period in Pakistan averaged 725 pounds per acre, compared with the much higher averages of 1,650 pounds in Japan and 2,050 pounds in the United Kingdom.

What is equally disturbing, is the considerable evidence that average yields have been trending downward for many years, owing to a depletion of the soils. But if state and central governments vigorously pursue a widespread program of teaching cultivators how to improve their practices, there is every reason to believe that the downward trends can be reversed. Fortunately, a beginning along these lines has already been made.

Over the next three decades the average output per acre must be increased by 50 percent if the people are to be adequately fed from domestic production. This is a substantial requirement, but, according to informed Pakistan leaders, it can be met if the following improvements are generally made, either singly or in combination, as conditions demand:

1. Increasing the supply of irrigation water.
2. Double cropping and, in some locations, triple cropping.


DISTRIBUTION OF POPULATION IN WEST AND EAST PAKISTAN
WEST PAKISTAN
EAST PAKISTAN
INDIA
Each symbol represents
108 persons per sq. mile.
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3. Row planting and deep plowing, and following other improved tillage practices.
4. Planting improved seed.
5. Rotating crops.
6. Using insecticides.
7. Applying more manures and fertilizers.

Were all these improvements generally adopted *except* the increased use of chemical fertilizers, it appears, on the basis of experience gained elsewhere, that over a period of years the average per-acre yield might be increased by 100 pounds. Thus two or three decades hence the 48 million acres contemplated as being in food grains would produce 2.4 million short tons more than otherwise expected. That would be an increase of nearly 20 percent, not quite half of what is needed.

To do better than that and to increase the yield by the required 50 percent, Pakistani farmers apparently will have to make widespread and intelligent use of chemical fertilizers. Chemical fertilizers have greatly increased crop yields in other countries and appear to offer great possibilities for Pakistan also.

Until 2 years ago only small amounts of fertilizer were being used in Pakistan: annual sales hardly reached 10,000 tons. But recently American aid funds have helped make possible the importation of larger quantities. In 1953 nearly 100,000 tons of ammonium sulfate were procured and distributed; in the first half of 1954, 50,000 tons. Enthusiasm for the use of fertilizer is reported to be growing among agricultural officials and cultivators.

If Pakistan is to meet half of the increment in food-grain requirements by increasing the use of fertilizers, its farmers should be using about 100,000 short tons of net nitrogen a year by 1960, about 210,000 by 1970, and 300,000 by 1980 (see table 2). This means that Pakistan should build and put into operation a new 50,000-ton net nitrogen plant every 5 years during the 30-year period under consideration. At the same time additional plants will be required to meet the minimum needs for phosphorus and potassium, which should amount to 150,000 tons by 1980. These estimates make no provision for meeting the fertilizer needs for cash crops such as jute, cotton, tea, sugar, and oilseeds.

Until now Pakistan unfortunately has been dependent on imports for the fertilizers it uses. However, it now has two small fertilizer plants under construction and expects to complete them within the next year. One of them will have an annual production capacity of 50,000 tons of ammonium sulfate; the other, of about 2,000 tons of superphosphate. So far as is known, these are the only plants in prospect; apparently the country has no plans for building a fertilizer industry anywhere near the size of what is visualized here as absolutely essential to a stable economy.

The difficulties facing Pakistan in financing the construction of a fertilizer industry large enough to meet the country's needs are undoubtedly great. At present prices, costs might run in the neighborhood of $250 million, or an average of $8.5 million a year for the next 30 years. Understandably there will be much reluctance to add a program of this magnitude to the other ambitious development programs already under way or in prospect; but, unless it is undertaken, Pakistan in all likelihood will continue to be an average net importer of food grains or fertilizers or both, with the net imports becoming progressively larger.

Food Consumption Patterns Change

Wartime and postwar food shortages and the need to concentrate on the production of high-energy foods have forced changes in the pattern of food consumption over large parts of the world. It is too early to judge whether any of these changes will be permanent, though there are indications that some may be. But it is already clear that with more abundant supplies and the relaxation of food controls there is a strong general tendency to return to prewar consumption patterns, except where changed price relationships have persisted. In Europe, for example, the consumption of cereals and potatoes, bulky foods rich in carbohydrates and calories, increased considerably during the war and early postwar years in order to ensure an adequate energy intake. By 1952-53, however, there was a marked drop in the consumption of these foodstuffs, especially coarse grains, consumption of which was half that of 1947-48. Similarly, in Japan, considerable efforts to increase the production of sweetpotatoes were made during and just after the war, but now sweetpotato consumption is even below that prevailing in prewar years. The decline in the consumption of such foods in many countries has been accompanied by an increase in the consumption of meat, eggs, and vegetable fats, which were formerly in short supply. However, prewar levels have by no means been fully restored in all countries, especially in the United Kingdom because of the more limited supplies of some foods, such as meat, for import.

The reversion to the prewar pattern of consumption might have been even more pronounced but for the uncertainties of the balance-of-payments situation in some countries.

Some important alterations in prewar consumption patterns have occurred partly through govern-

A Frenchwoman buys meat from a sidewalk vendor. In many parts of Europe, increased consumption of meat, as well as of eggs and vegetable fats, is accompanying a declining consumption of such bulky foods as cereals and potatoes.

ment efforts and partly through changed price relationships; some of these changes seem likely to persist. An impressive increase in the consumption of fluid milk has been stimulated in some countries by nutritional education and other measures, including subsidies. In some countries, reduced demand for butter at current prices is a further stimulant to the sale of fluid milk for human consumption. It seems unlikely that the long-term trend toward higher milk-consumption levels in many countries will be reversed, even though in some there has been a decline from the record levels attained a year or two ago.

Perhaps the most striking illustration of the effect of changed price relationships is the increasing substitution of margarine for butter. For example, in the United States, per capita consumption of margarine is now almost equal to that of butter, having increased nearly threefold from the prewar average while butter consumption fell by half.

Significant changes have also taken place in the consumption of staple cereals. For instance, the shortage of rice in postwar years and the high prices prevailing for rice compared with wheat were largely responsible for an appreciable shift from rice to wheat consumption in traditionally rice-consuming countries.

The recent fall in prices of rice gives some evidence that this trend is, at least partly, being reversed. For the most part, the increase in wheat consumption has taken place in large towns and coastal cities, which have an easier access to wheat from abroad. The long-term trend is uncertain, since rice supplies are becoming easier to get and rice eaters' habits are not easily changed, but there may be a permanently enlarged market for wheat in at least some of the rice-consuming countries. In Japan, for instance, an active campaign is being carried on to encourage the production and consumption of wheat and barley and to reduce the consumption of rice.

Factors likely to affect future trends of consumption are the increasing recognition of nutritional considerations in government planning of agricultural programs and the efforts in less developed areas to expand the production of cheap but nutritious foodstuffs such as pulses and fish, though it is sometimes difficult to overcome established preferences for traditional diets. For instance, a plant for large-scale commercial production of so-called soya milk is being installed in Indonesia. And in Chile efforts are being made to stimulate fish production and consumption; consumer acceptance tests of edible fish flour have already been completed successfully.

Per capita supplies of rice and wheat in Ceylon and Japan (in terms of flour), average 1934-38 and 1948-49 to 1951-52, annual 1952-53 and 1953-54

[In pounds per person]

Period or year	*Ceylon*		*Japan*	
	Rice	*Wheat*	*Rice*	*Wheat*
Average 1934-38	319.7	6.6	310.8	28.7
Average 1948-49 to 1951-52	218.2	55.1	233.7	70.5
1952-53	202.8	70.5	249.1	59.5
1953-54	207.2	72.7	216.0	59.5

A further factor that may affect the pattern of food consumption for individual countries is the change in age groups associated with the growth of population. Preliminary calculations indicate that in most countries average calorie requirements for the population as a whole will not be significantly changed, but that there may be a shift in requirements for certain types of food. For example, where birth rates remain high and infant mortality rates are falling, the proportion of children in the population will tend to rise, with a corresponding increase in the requirements for milk and other protein-rich foods. Recent studies establish beyond doubt that protein malnutrition among young children is the most serious deficiency disease prevalent in the underfed areas of the world.

A more general question is presented by the long-term changes in consumption patterns accompanying increased industrialization and rising real income. The most complete data on such changes relate to the United States. In that country total per capita food consumption, in terms of retail weight, hardly changed over the period from 1909 to 1952, but the nutritional quality of the diet improved considerably. The consumption of grain products, potatoes, and sweetpotatoes, which are important mainly as sources of calories, decreased about 40 percent. On the other hand, the consumption of protective foods increased considerably; for example, that of eggs increased over 40 percent, that of green vegetables about 60 percent, and that of citrus fruit and tomatoes 80 percent. Consumption of meats, poultry, and fish increased about 2 percent, though within this group the consumption of beef fell and that of poultry rose. Before World War II similar trends were apparent in most of the industrialized countries in Europe.

It does not, of course, follow that industrialization in the less developed countries will be accompanied by similar changes in food-consumption patterns. Where the calorie intake is extremely low, the first need is for increased supplies of high-energy foods, and there is little doubt that this will be the early response to rising per capita real incomes. But in the long run it is likely that consumption of protective foods will increase.

This does not mean that per capita consumption of cereals for all purposes will decline as income rises. On the contrary, as agricultural development proceeds hand in hand with industrialization, the emphasis on livestock farming that is predominant mostly in the advanced countries is likely to spread increasingly to the less developed countries. This will entail the use of larger quantities of cereals for feeding animals. In fact, per capita consumption of cereals for all purposes is currently larger in countries with relatively high national incomes than in low-income countries where consumption of cereals for food is usually high.

(Adapted from *The State of Food and Agriculture 1954,* issued by the Food and Agriculture Organization of the United Nations, August, 1954.)

Open-air market in Paris. Food is more abundant there now and shoppers are returning to prewar consumption patterns.

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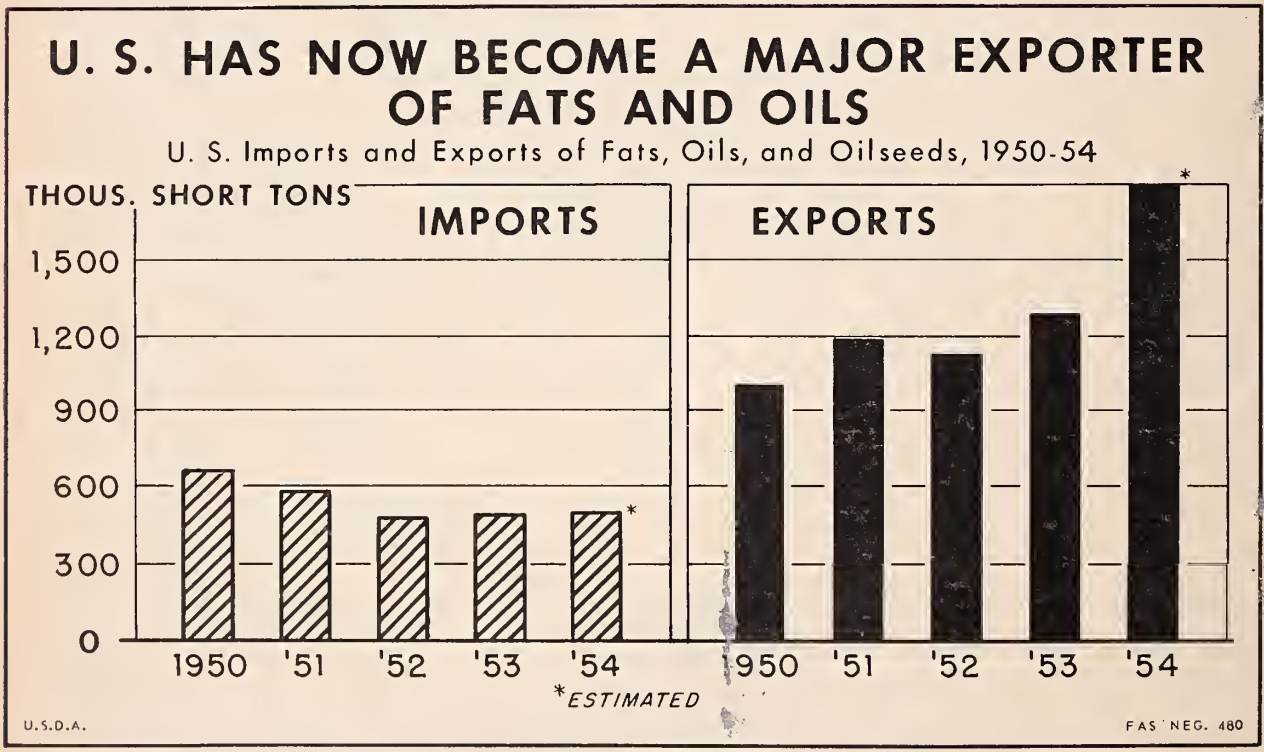
U. S. HAS NOW BECOME A MAJOR EXPORTER OF FATS AND OILS
U. S. Imports and Exports of Fats, Oils, and Oilseeds, 1950-54
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